

CBA Working Paper 2022/03



FPAS Mark II: Avoiding Dark Corners and Eliminating the Folly in Baselines and Local Approximations

by David Archer, Martin Galstyan and Douglas Laxton*

October 13, 2022

*Other authors include Vahe Avagyan, Hayk Avetisyan, Meline Gevorgyan, Edgar Hovhannisyan, Haykaz Igityan, Hayk Karapetyan, Asya Kostanyan, Jared Laxton, Anahit Matinyan, Armen Nurbekyan, Anzhela Papikyan and Mariami Tchanturia.

Acknowledgements

We would like to thank the Board of the Central Bank of Armenia ¹ for their leadership and support in exploring new possibilities for monetary policymaking. Additional thanks to CBA Deputy Governor Nerses Yeritsyan for his longstanding innovative thinking in pushing the Board and the staff to move away from a baseline-focused approach. The development of the proposals made in this paper has immensely benefited from their contributions and critical thinking.

We thank John Taylor for providing comments on these proposals at a Better Policy Project Seminar on September 16, 2022. We also thank Michael Bordo and Mickey Levy for their helpful comments provided at a Better Policy Project Seminar on August 24, 2022. See www.thebetterpolicyproject.org for a list of acknowledgements of people that were critical in the development of published endogenous policy baseline projections—the current gold standard for monetary policymaking that we wish to modify in order to take better account of uncertainty—at both the Bank of Canada and the Reserve Bank of New Zealand.

Abstract

The major challenge facing central banks today is the inability of existing policymaking frameworks to adequately deal with significant and increasing uncertainty. While the Forecasting and Policy Analysis System (FPAS), used by leading inflation-targeting central banks, has been successful in introducing a systematic strategy and framework for analyzing and describing policy decisions, it is unable to deal with this problem of uncertainty, due to what we term its “folly in baselines and local approximations.” This paper argues that “monetary policy as risk management” (MPRM) is the appropriate method for conceptualizing forward-looking monetary policy in situations of significant uncertainty. Specifically, this paper proposes a new policymaking setup—“FPAS Mark II”—that combines successful parts of the institutional framework of Mark I systems with an MPRM approach to dealing with uncertainty. FPAS Mark II shifts the policymaking focus from optimizing the policy path for the most likely (baseline scenario) future to a multiple-scenario-based approach that is more relevant to economic realities and better able to challenge the prevailing wisdom that results in policy inertia. Importantly, the shift to a scenario-driven approach allows the central bank to move away from its “expert forecaster” role of trying to predict most likely outcomes, and instead focus its efforts on its “risk manager” role of avoiding what Olivier Blanchard terms “Dark Corners” and dealing successfully with situations of great uncertainty—the essence of good policy.

¹In particular Hasmik Ghahramanyan, Artak Manukyan, Davit Nahapetyan, Deputy Governor Hovhannes Khachatryan, Levon Sahakyan and Arthur Stepanyan.

Contents

1	Introduction	4
2	Background	5
3	Operationalizing Monetary Policy as Risk Management	9
4	The Analytical Framework	10
	A Core Quarterly Production Models	11
	B Satellite Models	12
5	The Institutional Framework	12
	A Core Principles of the FPAS Mark II Process	13
	B Structure and Process	14
	C The Characteristics of Candidate Scenarios (The Three R's)	18
	D A Paradigm Shift	19
	E The Role of the Team	21
6	An Application: Summer 2021	22
7	The Communication Framework	25
8	Challenges and Risks	28
	A Acknowledging and Explicitly Addressing Uncertainty . .	28
	B Attempting to Quantify the Implications of (Multiple) Nonlinear Processes	28
	C Confronting Policy Decision-Makers with so Many Un- knowns	29
9	Concluding Remarks from Governor Galstyan	30

1 Introduction

Central banking is currently in a very troubled state. Many of the comments Lawrence Summers has made over the last year or so were directed at advanced-country central banks like the Fed, but they also apply in some respects to the more seasoned and transparent central banks that have been practicing Flexible Inflation Targeting (FIT) for much longer—see Laxton and Rhee (2022) and Kostanyan and others (2022a). Among the challenges being confronted is that the process of policymaking and communication has not satisfactorily dealt with the existence of uncertainty and nonlinearities. As a result, when uncertainty manifests itself in large differences between central bank forecasts and reality, policymakers find it difficult to adjust the policy instruments sufficiently aggressively, because it implies an admission of being wrong and losing credibility. Policy effectiveness, as well as central bank credibility and legitimacy, is at stake.

This working paper explores the nature of the problem and proposes a solution. This solution is built upon the critical assumption that uncertainty will not go away entirely; rather, that it might worsen from time to time as the world starts to experience more stagflationary shocks related to geopolitical events, climate change, and energy security. Our proposed solution operationalizes Greenspan’s 2004 characterization of monetary policy as risk management (MPRM) by replacing the search for policy paths optimized for the most likely future with *scenario analysis*, in which different plausible futures and policy paths—including importantly nonlinear ones—are evaluated for the harm that might result. Scenarios revealing the different workings of the adopted policy strategy, in different currently-relevant economic contexts, prepare economic agents for an inherently uncertain future. They further encourage the central bank to adopt more agile policy stances, and provide the disclosure of the connections between intended policy actions and objectives that is essential for maintaining legitimacy.

Most of the ideas in this paper are not new. This paper, however, proposes an institutional framework to operationalize these ideas, while avoiding unconstrained discretion and improving transparency and accountability of central banks.

The rest of this paper is organized according to the following structure. Section 2 presents a few reflections on uncertainty and risk management by leading policymakers that align with our desire to update the current gold standard for monetary policymaking (designated as Forecasting and Policy Analysis Systems, or “FPAS,” by Berg, Karam and Laxton (BKL), 2006a,b). Our preferred framework seeks to eliminate the folly in baselines and local approximations, and instead to think of monetary policymaking as an MPRM exercise where policymakers try to avoid what Olivier Blanchard has termed “Dark Corners.” Section 3 discusses how a structured version of MPRM has been simulated in practice at the Global Forecasting School (GFS) at the Dilijan Training Center (DTC) of the Central Bank of Armenia (CBA). Sections 4 and 5 elaborate the analytical and institutional frameworks of FPAS Mark II that are under development. To demonstrate just how easily MPRM can be applied in practice,

Section 6 provides an application of the ideas to the temporary-versus-persistent inflation debate in the summer of 2021. Section 7 discusses the communication framework of FPAS Mark II, while Section 8 delves into the challenges and risks associated with this new system. Finally, Section 9 provides Governor Galstyan’s concluding remarks about the current state of play at the CBA and the CBA Board’s priorities for the future.

2 Background

In an important speech to the economics community in 2004, then Chair of the Federal Reserve Alan Greenspan argued for a risk management approach to monetary policy. Rather than configuring policymaking as an optimization exercise, “the risk management framework emphasizes understanding as much as possible the many sources of risk and uncertainty that policymakers face, quantifying those risks when possible, and assessing the costs associated with each of the risks.”

Monetary policy as risk management may have started as early as February 1994, when the Fed took preemptive actions to raise rates before clear signs of rising inflation had emerged. Goodfriend (2010) considered this to have been only the second time that the Fed had taken preemptive action of this nature. In Greenspan’s telling, waiting to raise rates until there was clear evidence for rising inflation would allow inflation expectations to ratchet upwards; this provided a justification for raising rates earlier. These increased inflation expectations would then require much higher interest rates and larger (cumulative) unemployment costs to bring inflation back to levels consistent with objectives. If, on the other hand, inflation were to not rise even though unemployment fell below the 6 percent estimated non-accelerating inflation rate of unemployment (NAIRU), interest rates could be cut and objectives could be met without a nonlinear rise in unemployment costs.²

The Great Moderation seemed to render MPRM unnecessary. Policy gradualism, designed to introduce history dependence in the policy process, was considered an efficient way of harnessing private expectations to amplify the power of policy impulses (through the impact on long rates) without causing costly short rate volatility (Woodford 2003). Policy inertia increased, possibly spurred by the growing tendency to project the future of policy (forward guidance) and the associated potential for markets to perceive excessive commitment to the advertised policy rate path. This created taper-tantrum risks that make central banks more hesitant to respond to unexpected realizations (Bernanke 2022).³

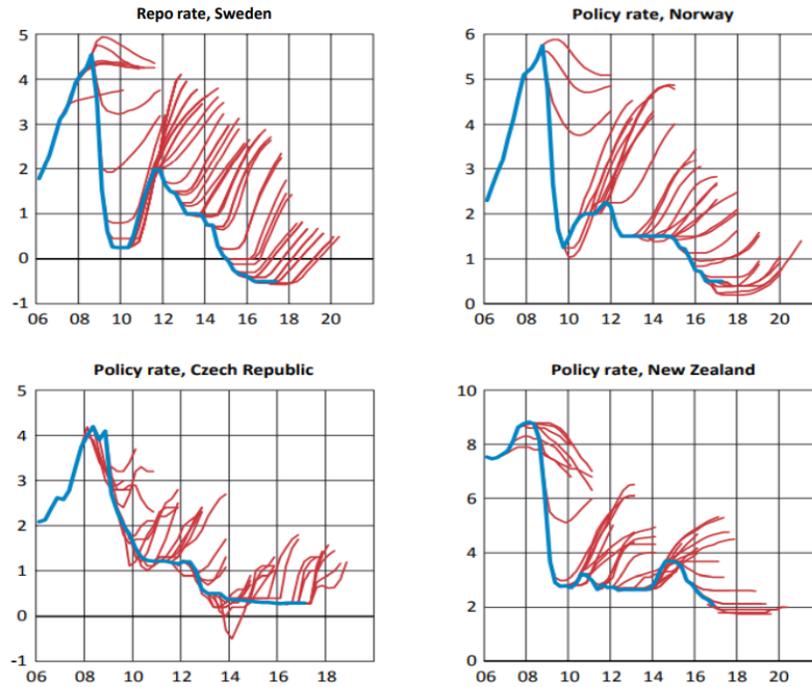
²Underlying this cost-benefit analysis was a particular view of the Phillips Curve with convexity and endogenous policy credibility, a view challenged by Stiglitz, who argued that the Phillips Curve was concave (meaning there might be benefits from experimenting with lower levels of unemployment)—see Isard and Laxton (1999).

³Policy inertia is unlikely to be a function only of “optimal” gradualism and lock-in associated with forward guidance. Bordo and Levy (2022) document a history of Fed inertia around exits from periods of easy policy. An, Tovar Jalles and Loungani (2018) document a strong

However, subsequent shocks, along with revelations of the limitations to central bank understanding of current economic dynamics, brought MPRM back into the lexicon of central banking. Evidence has been accumulating of serially correlated forecast errors associated with the slow updating of central banks' understanding of prevailing system dynamics.

Figure 1 below presents a comparison between repo/policy rate forecasts and the actual rate cross four central banks (Sweden, Norway, Czech Republic, and New Zealand). These central banks, despite differences across time/geography/economic conditions, consistently overestimated the actual policy rate in similar way; earlier unpublished records similarly show a consistent tendency to underestimate the policy rate when economic activity and inflation pressures are above target and calibrated "normal" levels.

Figure 1: Policy Rates versus Forecasts; Selected Countries, 2006-2021



Source: Asterlind (2017)

A brief selection of quotes from a rapidly growing body of references to MPRM illustrate that central bankers are increasingly aware of the challenges caused by uncertainty, including for the use of policy forecasts and forward guidance as tools.

tendency for official sector and private forecasts to miss turning points towards recessions; recognition lags are likely to be a feature of slow policy response.

Poloz, former Governor of the Bank of Canada, *Monetary policy in unknowable times*, May 25, 2020:⁴

Moving monetary policy from the theoretical, or formulaic, space into a problem of risk management acknowledges and accepts the uncertainties inherent in policy making. This does not mean rejecting the use of models in decision making. In fact, the Bank's various models provide the base case that serves as the starting point for deliberations. They are also used to simulate alternative scenarios, which is an excellent means of reaching a fuller understanding of the risks we face. The essence of risk management is identifying the most important risks and uncertainties around the outlook. We examine the probabilities that the risks will be realized, consider alternative futures related to uncertainties and think about the potential consequences of making a policy error. We then choose a policy course that weighs these risks and uncertainties in order to best manage them...

... Given all the uncertainties and risks, it does not make sense to think a single, optimal path for our policy interest rate will be consistent with achieving our inflation target. It makes no sense to try to engineer such a path with precision.

Jerome Powell, Chair of the Federal Reserve, *Monetary Policy and Risk Management at a Time of Low Inflation and Low Unemployment*, October 2, 2018:⁵

The Committee takes a risk management approach, which has three important parts: monitoring risks; balancing risks, both upside and downside; and contingency planning for surprises...

... From the standpoint of contingency planning, our course is clear: Resolutely conduct policy consistent with the FOMC's symmetric 2 percent inflation objective, and stand ready to act with authority if expectations drift materially up or down...

Christian Hawkesby, Assistant Governor of the Reserve Bank of New Zealand (RBNZ), *Policy of Least Regrets*:⁶

It involves identifying the most likely ways that the economy could evolve differently than in our central view, and what our mandate implies about our "regret" if these risks eventuate. The language of least regrets – the mirror of maximizing our chances of success – conveys our humility about being able to accurately predict the future.

It's important to emphasize our least regrets approach is not designed to be applied in a rigid or formulaic way. Rather, it is where the science of macroeconomics meets the art of policy decision making.

⁴See Poloz (2020).

⁵See Powell (2018).

⁶See Hawkesby (2021).

However, as articulated by Greenspan, and as currently described by central bankers, MPRM is difficult to distinguish from unconstrained discretion. The hallmarks of current descriptions of MPRM are references to data dependency, the absence of even general forward guidance, eschewing pre-emptive policy, and extensive use of assurances that the central bank will “do the right thing” when the time comes. Only the RBNZ has articulated a decision-making framework for MPRM—as a “policy of least regrets”—but it too has found it difficult to communicate the content of that policy in a way that allows either private agents to anticipate the central bank’s actions or the political process to perform accountability.

From the perspective of political legitimacy, this conception of MPRM is seriously inadequate. It fails to formulate the link between policy objectives and likely policy behavior, a link that is critical both for political accountability and for allowing markets to anticipate likely policy responses to events. Clearly articulating the policy strategy—the link between objectives and policy behavior—is crucial because outcomes of policy regimes are detectable only over time (and then only weakly so) by observing policy choices across a range of circumstances. To address these anticipation and accountability gaps, several central banks that use Flexible Inflation Targeting (FIT) began providing projections based on policy-consistent instrument paths. This FPAS approach demonstrated the benefits of analyzing and describing policy choices in terms of a systematic strategy, with quantification. These benefits are nowhere emulated by MPRM as typically described.

Nonetheless, the notion of MPRM is an entirely appropriate response to uncertainty. Uncertainty is only irrelevant when the world is benign, where simple linear rules can effectively run monetary policy in a mechanical way. Yet Mark I versions of the FPAS, which are currently used extensively in even seasoned FIT central banks, are also vulnerable to precisely the same uncertainty that motivates MPRM thinking. Deciding and communicating policy actions based on baseline forecasts and local approximations—as FPAS Mark I does—can be highly problematic when the policy-relevant future is unknowable. Draping such projections in the clothes of assurance and confidence has the potential to mislead both policymakers and economic agents by providing a false sense of security when planning. In turn, having been misled, policymakers may choose actions that amplify projection and policy errors. The mismatch between baseline projections and what actually materializes can have impacts on credibility, particularly given the language and style through which monetary policy is communicated to the public.

This paper argues that MPRM is indeed the appropriate way of conceptualizing forward-looking monetary policy in situations of significant uncertainty. But MPRM need not be synonymous with full discretion. An adaptation of FPAS provides a practical policy strategy that allows MPRM to be consistent with political legitimacy and efficient policy signaling. The essence of the innovation is to avoid baseline forecasts and instead focus on policy projections that describe the necessary policy responses to the main risks, should they materialize. Using scenarios to describe policy responses to the realization of risks

harnesses the power of FPAS to create clear policy narratives that illuminate a consistent policy strategy. The key distinction between FPAS Mark I and Mark II narratives is that the former uses a singular “most likely” instrument path to concretize the policy strategy, whereas the latter, by providing more than one instrument path’s response to different-but-similarly plausible situations, shifts attention to the workings of the policy strategy itself.

Reinforcing the proposal is an argument that dealing successfully with situations of significant uncertainty is the essence of good policy. Such situations have orders of magnitude greater welfare implications⁷ than those characterized by more normal additive noise. Due to the interaction of uncertainty and nonlinearity, the former situations can give rise to “Dark Corners” (in Olivier Blanchard’s terminology)—policy traps that require extraordinary policy action, and costs to welfare, to escape from. State-contingent degrees of policy activism are required, because once a slide towards a dark corner becomes a notable risk, immediate and assertive policy action becomes the priority, something not available from simple linear mechanical rules. In contrast, substantial and state-contingent policy activism has limited payoffs in the normal business cycles described in textbooks.⁸ In the context of these textbook business cycles, a weak understanding of the transmission mechanism, coupled with recognition and policy lags around cyclical turning points, reduces the efficiency of activist policies relative to their simple linear mechanical rule alternative. Estimates of welfare gains are small relative to their confidence intervals.

Accordingly, the sought-after MPRM strategy would specifically gear policy-making towards spotting the risk of slippage towards a dark corner and enable an assertive policy response. To assist market understanding of such strategies and anticipation of likely policy actions, and to provide a basis for effective accountability, risk scenarios that provide clear policy narratives should move to the front of the stage, pushing off stage unreasonably confident forecasts.

3 Operationalizing Monetary Policy as Risk Management

Despite the growing discussion of MPRM (e.g. Bullard 2021, Weidmann 2022, in addition to Hawkesby, Poloz and Powell, cited earlier), little has been done to implement such a policy strategy within a transparent analytical framework. What follows are specific operational components of such a strategy. We wish to develop an analytical framework that addresses important issues related to uncertainty and nonlinearities.

Prior to the clarification of price stability as the primary objective of monetary policy and the development of FPAS, monetary policy was largely discretionary

⁷We refer to welfare implications from an economic perspective (e.g. low unemployment, output gaps, etc.) rather than in its colloquial sense of “social” welfare. The CBA will be releasing a series of forthcoming papers on this topic. Refer to Avagyan et al (2023c, h, m, r).

⁸Refer to the forthcoming paper by Avagyan et al (2022b, 2023d, i, n, s).

in character. The initial FPAS frameworks built by early Inflation Targeting adopters centered on: (1) a clear target to direct policy; (2) forecasts with objective-consistent *paths* for policy, to address its forward-looking nature; and (3) systematic and transparent communication of that path. However, by placing forecasts at the center of analysis and communications, these frameworks remain vulnerable to knowledge gaps concerning current macroeconomic dynamics—especially those directly involved in policy transmission—in addition to generalized uncertainty about future shocks. Over the past two decades at least, central banks in advanced economies have been confronted with un-forecasted low- and high-inflation environments, during which forecasts of appropriate policy paths consistently underestimated the policy action required. Central bank expertise, despite being guided by clearer targets, has delivered policy that is excessively inertial. This entrapment pattern is harmful to society, and to the credibility of the institutions involved.

A modification of FPAS, referred to as FPAS Mark II, sets out to achieve three interrelated objectives:

1. To elevate attention to uncertainty in monetary policymaking by implementing MPRM with a particular emphasis on avoiding Dark Corners;
2. To shift the policymaking focus from optimizing the policy path for the most likely future to ensuring policy agility, in order to reduce the risk of sliding into Dark Corners;
3. To remove (self-imposed) restrictions on sharp adjustments of the policy stance (tighter and looser) when needed to prevent slides into Dark Corners.

The analytical and institutional modifications needed for FPAS Mark II are described in the following sections.

4 The Analytical Framework

A major drawback of FPAS Mark I was a rudimentary handling of non-linear dynamics in models and analysis. Important non-linearities associated with monetary policy (for example, those related to the Effective Lower Bound (ELB) on policy interest rates, the presence of rationally inattentive agents, and endogenous policy credibility) were not attended to. Instead, a simple open economy gap model closed by an endogenous monetary policy reaction function (BKL, 2006a, b) was the preferred workhorse model. It captured the major elements and principles of monetary policy needed for the task of regaining nominal stability; these elements remained suitable for the Great Moderation that followed. Inflation was successfully brought to low levels and kept low without notable additional challenges. Issues around the ELB subsequently became a major topic of discussion, but greater attention was paid to financial stability implications than nominal stability ones. Modeling innovations focused on adopting DSGE

methods and on proxying the policy effect of QE as an instrument in some way, such as via the term premium on long-term bonds—see Engen, Laubach and Reischneider (2015).

As with FPAS Mark I, the FPAS Mark II framework will incorporate a suite of models including a “workhorse” Core Quarterly Production Models, supplemented by a series of satellite models to understand more specific items (e.g. effects of fiscal policy, external shocks, etc.). The adaptations needed for FPAS Mark II seek to avoid the limitations of FPAS Mark I models, in particular the core workhorse model, as described in the following sections.

A Core Quarterly Production Models

Workhorse semi-structural FPAS Mark I models can be modified for use in FPAS Mark II frameworks in two main ways: (1) building in a small number of crucial non-linearities; and (2) implementing an explicit loss function (as a replacement for linearized policy reaction functions).⁹ Critically, the workhorse model would come in two flavors: with endogenous policy credibility (by which monetary policy can gain or lose credibility depending on outcomes) and with exogenous credibility. An example Mark II workhorse model, described in Kostanyan and others (2022a), contains two key non-linearities—endogenous policy credibility; and non-linearities in the inflation equation—and uses an explicit loss function to characterize the monetary policy process. This model is used to generate illustrative scenarios presented in Section 6 below. To be sure, credibility is just one of the important non-linearities relevant for monetary policy. The reason we attach such a prominent role to credibility in the core workhorse model is that it underlines the notion that the hesitancy of policymakers to adjust the rates sufficiently aggressively has non-linear welfare costs, because the loss of credibility always implies moves that are more aggressive in future.

Semi-structural models are preferred over full DSGE ones primarily because of their greater flexibility in handling a variety of nonlinear features that may be relevant to the scenarios being evaluated. The ability to represent scenario-relevant nonlinear processes is more highly valued than micro-foundedness. Further, loss functions are preferred over policy reaction functions for two reasons. First, loss functions are more robust to the changes needed to the model struc-

⁹A third modification to these workhorse models that will be more relevant for some central banks than others is stripping the model of peripheral features designed to increase the granularity (of income and detailed expenditure components, and of sectors) of forecasts but with no impact on model dynamics. Relatively speaking, FPAS Mark II shifts attention towards alternative core economic dynamics and away from detailed elaboration of a most likely future for the sake of appearing as experts that understand all the details. Of course, research on many issues does require very detailed analysis of the data; it is just that all of this can happen in a much more efficient process if the core models are left unencumbered by detail. The idea of satellite models to fill in many of the details, when required, will continue to be a prominent component in FPAS Mark II as well as a real-time reporting system that updates many more details than what was typically included in FPAS Mark I. Indeed, work is underway to develop the infrastructure to handle much higher frequency time-series and meta data in a mixed-frequency QPM to support FPAS Mark II.

ture when evaluating scenarios involving alternative economic dynamics; the emphasis, in most cases, is to understand the policy implications of parameter uncertainty, rather than waste effort estimating the modes of a DSGE model without any real appreciation of such analysis for the policy implications of parameter uncertainty. Second, the use of an explicit loss function allows the calculation of a metric for total losses over the policy-relevant full horizon, an important ingredient for risk assessment.

B Satellite Models

While not an innovation of Mark II, additional satellite models will provide a further analytical toolkit to better understand tail risks. These include a Mixed-Frequency Model, which would blend near-term forecasts and medium-term policy projections. This model would incorporate high-frequency data (almost real-time) along with large amounts of metadata (which would not necessarily be limited to quantitative observations).

Additional models would deal with understanding specific shocks and linkages, including:

- Mapmod: understand macro-financial linkages;
- Totmod: explore terms-of-trade shocks, such as oil prices;
- Global Model: understand external shocks;
- Foodmod: examine food shocks;
- Fiscmod: explore the effects of fiscal policy.

These kinds of models help motivate the nonlinear relationship between policy and the achievement of its objectives via the short-run output-inflation trade-off in a practical and intuitive way. It is worth emphasizing that some of these models can be and are used in FPAS Mark I central banks. The value added of this models, however, mainly stems from building scenarios, which include important insights from nonlinear dynamics and associated tail risks. We therefore think that FPAS Mark II will multiply the benefits from using these models, because risk management and tail risks are at the front and center of the new framework.

5 The Institutional Framework

The purpose of this section is to outline the essence of FPAS Mark II policy process and then to suggest practical institutional arrangements for the FPAS Mark II setup to ensure that systematic attention is paid to policy risks and uncertainties when making and explaining monetary policy decisions.

As with the original paper defining FPAS Mark I,¹⁰ this section focuses on a

¹⁰Refer to Berg, Karam and Laxton (2006a, b).

specific proposal for implementing FPAS Mark II, which we believe is workable and can be put into practice extremely efficiently. We, of course, recognize that some central banks could choose to tailor this approach to their specific circumstances, taking into account their institutional structure, legal requirements, and organizational culture, among others. With this background in mind, this section begins with the basic procedural principles that must lie at the core of every country-specific iteration of the FPAS Mark II system.

In Section B, we introduce a specific proposal that we believe to be workable for most central banks, including what we are implementing at the Central Bank of Armenia. The reason specificity is important here is that the process of adopting a new policymaking system is not an easy task. As the earlier experience of many central banks' transition to FPAS makes clear, banks that could not agree on clear procedural and organizational standards got lost in the process and were unable to implement FPAS.¹¹ Those that were successful, however, benefitted from clear standards such as those outlined in Berg, Karam and Laxton (2006a, b). To aid central banks in the often difficult process of developing and agreeing on procedural and organizational changes, we provide policymakers with a specific policy process that can serve as an important benchmark when implementing FPAS Mark II.

A Core Principles of the FPAS Mark II Process

As noted extensively throughout this paper, FPAS Mark II's key innovation is shifting the focus to a scenario-based approach. These scenarios represent policy responses that would be needed should the main currently-relevant risks materialize. Evaluating hypothetical—but realistic—scenarios allows attention to shift away from low-value efforts aimed at identifying the optimal policy for scenarios that are only marginally different. Instead, focus shifts to preparing policy for sufficiently aggressive movements, in the event that significantly different scenarios materialize.

To achieve this paradigm shift in practice, the FPAS Mark II policymaking cycle should proceed along the following steps, each of which have specific outcomes:

- **Step 1: Sketch Ingredients:** The first step would engage decision-makers in an open process, which enables them to sketch the broad ingredients of their individual scenarios, reflecting their unique perspectives and concerns.¹² After this meeting, decision-makers would have the necessary ingredients to formulate (non-quantitative) narratives for upside, downside or (sufficiently relevant) tail risk cases.
- **Step 2: Select Ingredients:** With the outlines of these scenarios in place, the next step involves selecting the main ingredients for a small

¹¹See Kostanyan et al (2022) for examples of FPAS Mark I and non-FPAS Central Banks, the latter of which have very low levels of transparency.

¹²Decision-makers would typically be comprised of Board members, MPC members, or Governors depending on the institutional setup.

number of reference scenarios (upside, downside, and tail risk). In this step, it is especially important for the decision-making body—with an institutional basis—to define a specific process for selecting the ingredients to build the scenarios, such as the one we present in Section B. It is worth emphasizing that this process is not a simple mechanical aggregation process. Rather, it is a dynamic process that is meant to capture the richness of decision-makers’ ideas, and use a lively culture of debate and discussion to spur rigorous thinking about these ingredients. At the same time, it would take maximum advantage of the professionalism of a highly-trained staff that would produce the modeling, analysis, and communications at world-class standards.

- **Step 3: Build and Quantify Scenarios and Narratives:** Staff (led by, e.g., a Chief Economist or Projection Coordinator) would then use these selected ingredients to construct the actual quantitative scenarios and provide the basis for evaluation (e.g. by using a loss function). Staff would also develop non-technical narratives that describe the scenarios and their implications.
- **Step 4: Decision-making and Communication:** At the policy decision meeting, decision-makers would use their normal decision protocols to set the policy instrument that would best minimize regret. Given the richness of scenarios discussed in the early stages of the process, as well as the quantified reference scenarios with endogenous policy paths, decision-makers will have the basis for making a well-informed, least-regrets policy decision, as well as for formulating the narrative accompanying the decision, to be communicated with the public.

The four steps roughly outlined above have specific outcomes, each of which are essential for operationalizing FPAS Mark II for different institutional, organizational and legal settings.

B Structure and Process

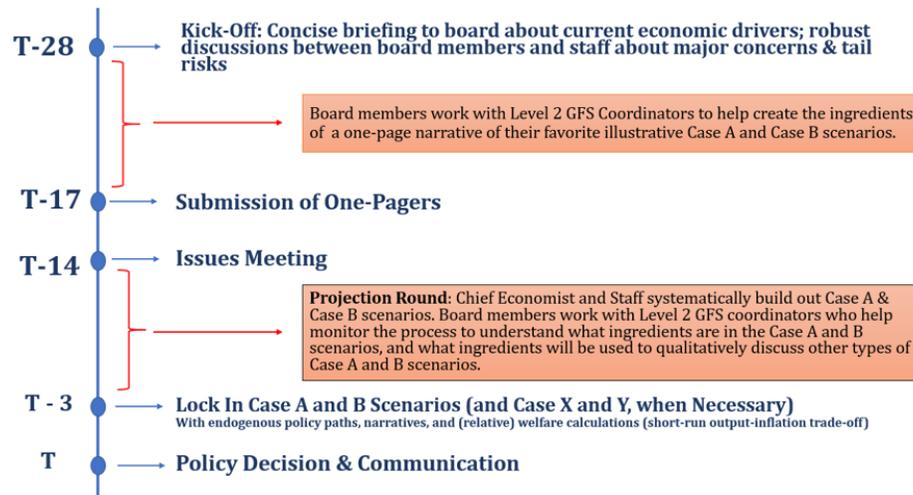
This section presents a specific procedural and organizational implementation of the above principles, which we believe to be workable and immediately usable for most central banks. We of course proceed with the assumptions that the central bank has already invested sufficiently to implement the FPAS Mark II analytical framework described above, and that the Board has agreed upon this specific framework. Neither assumption is trivial; further discussion of the practical challenge of moving from current to new arrangements will follow in another paper.¹³ Against this background, we now explore in greater detail what the FPAS Mark II structures and process could look like.

¹³A high-level overview of the forthcoming paper on transition challenges is as follows. The key challenge in making a transition will be for the Board to reconcile itself to presenting the institution externally as having incomplete knowledge. Once that is accepted, decision-making on key risks and their policy implications may be easier than decisions on baseline

The Policymaking Sequence

The policymaking sequence proceeds as a 28-day process that is intended to be collaborative and iterative, and result in greater efficiencies from a resource allocation and time perspective. Below, we provide a general outline of the policymaking process. However, having a clear sequence of events does not imply that the process proceeds mechanically or by rote. Quite the opposite—the 28-day policymaking round is a *dynamic* process that prioritizes a lively culture of debate and discussion, capitalizes on the unique attributes and critical thinking of each Board and staff member, and provides important flexibility and agility to the Board.

Figure 2: The 28-Day Policymaking Round



- **Kick-Off Meeting:** To begin the policymaking round, the Board meets in a general meeting intended to spur robust discussion about the major tail risks and uncertainties that represent particular causes of concern. The meeting begins with a brief staff presentation on major economic drivers, statistics, and trends, which will help to inform the discussion.

projections, because no commitment to a particular instrument path is involved (commitment is to a policy strategy). For FPAS Mark I central banks, the main staff challenges will be to modify workhorse models to handle non-linear dynamics, and develop the ability to generate scenarios focused on core macroeconomic dynamics. Some changes in the mix of staff skillsets would be required through comprehensive training, coaching, and collaboration, a continuous process that would take six years to reach a steady state, reflecting the six GFS Qualification Levels (refer to www.thebetterpolicyproject.org/global-forecasting-school). For central banks not practiced in producing endogenous policy projections, the development challenge will be bigger. Our experience with a range of central banks suggests 1-3 years for FPAS Mark I cases and longer for others. Of course, board vacillation on the policy strategy would significantly delay progress.

The purpose of the discussion is to fuel deep thinking about tail-risk scenarios and other concerns the Board may have (e.g., a looming financial crisis, underpricing of risk, high- and low-inflation traps, etc.), rather than being driven by specific numbers or projections. Ideally, the Board and the staff would spend most of the meeting on discussing their concerns and risks in mind rather than on the recent data, because most central banks have weekly monitoring meetings, which are dedicated to the discussion of current data and near-term outlook. In extraordinary *force majeure* instances, the meeting can also be used to recalibrate the Board’s approach and work plan in the round.

- **Develop Ingredients of Relevant Scenarios:** Following the kick-off meeting, the Board members, working with Level 2 GFS Coordinators,¹⁴ each outline the *essential ingredients* that would be used to build Case A and Case B scenarios, according to their own thought processes. Case A would be a scenario where the policy rate path has to be higher than market expectations (hawkish scenario) to bring inflation back to the target, and Case B would be the scenario where the policy rate path has to be lower than market expectations (dovish scenario). The Board would not be tasked with creating these scenarios themselves, but rather, would focus on developing the key ideas that would serve as important inputs to the scenarios.
 - **Submission of One-Pagers:** In collaboration with their Coordinators, Board members submit succinct one-page narratives outlining the high-level ingredients and assumptions related to what they would include in their preferred Case A and Case B scenarios. The one-pagers would be submitted to the Projection Coordinator¹⁵ three days in advance of the Issues Meeting.
 - We emphasize that these One-Pagers are not pre-deterministic, and Board members are not in any way tied down to the ideas they express in this preliminary stage. Rather, the hope and expectation is that when Board members arrive at Decision Day (see below), they feel completely comfortable about changing their initial viewpoints, particularly in light of the debates and discussions of the preceding weeks. This is a feature—not a bug—of FPAS Mark II.
- **Issues Meeting:** Two weeks before the decision day, an Issues Meeting is held between the Board and the Projection Coordinator. After having the

¹⁴Refer to <https://www.thebetterpolicyproject.org/global-forecasting-school> for a description of the six GFS Qualification Levels. Level 2 GFS coordinators have sufficient training, skills, and expertise to support the Board in brainstorming ingredients, drafting one-pagers, and monitoring the construction of the official Case A and Case B scenarios. The primary role of this staff is to serve as a key bridge and linkage between the Board and the forecasting team.

¹⁵In some central banks, Projectio Coordinators are the heads of monetary policy or economics departments and have the title of Chief Economists. The two titles are used interchangeably in this paper.

big picture of Board concerns, under the authority of the Governor, the Projection Coordinator formulates Case A and Case B scenarios, which would be ultimately used for communication purposes. Some of the ingredients that the Board Members presented would be used as input to construct the two Case A and Case B scenarios. It is important to note that the Board members' ingredients that are not used to build the Case A and Case B scenarios would not be dismissed or ignored. Rather, these ingredients would serve as rich topics for debate and discussion in the decision-making process, and would also provide helpful inputs to formulating other types of Case A and Case B scenarios as well as tail risks, which we call Case X/Y scenarios.¹⁶

- Having these tail-risk ingredients as a source of discussion throughout this entire process would provide Board members with important flexibility and agility in making their policy decision and revising their thinking and approach throughout the process. In addition, the Case A and Case B scenarios, which are constructed by the Projection Coordinator, should not be a mechanical aggregation of individual Board members' scenarios, rendering the whole process to be mechanical and defying the very objective of eliminating the folly in scenarios.
- The Board's main role would be to contribute to the *process* through buy-in and support, rather than focus on formulating the specific assumptions. The Board would leave the meeting with a solid mental picture about how the scenarios will be fleshed out, and place trust in their staff for producing the scenarios and the Monetary Policy Report.
- **Projection Round:** The Projection Coordinator leads daily quarterly projection meetings with the staff. Through a collaborative and iterative process, the Projections Coordinator systematically and clearly builds out the Case A and Case B scenarios, quantifying the scenarios through semi-structural core quarterly production models and satellite models, where feasible. Particular attention would be paid to their policy implications (in terms of the forward paths for instruments needed to achieve convergence on objectives) as well as their welfare metrics. Board members' Level 2 GFS Coordinators can participate on a voluntary basis in these meetings, to monitor the process and understand what ingredients are being included or excluded.

¹⁶While there may be a large number of feasible, plausible scenarios for how an economy will develop from its current position, we posit that policymakers typically have a sense of the main alternative stories. These are likely to be the scenarios worth evaluating and using as reference points for the risk assessment. Highly advanced central banks with significant resources, such as the Fed, or smaller FPAS Mark II banks that have matured significantly in this process, could consider evaluating multiple scenarios beyond just two, and could flesh out full scenarios rather than just focusing on ingredients.

- It is worth emphasizing that the Projection Coordinator’s selection of Case A and Case B scenarios would not be prescriptive, and would not tie down Board members to a predetermined position. The Projection Coordinator’s formulation and elaboration of these scenarios are intended to serve a purely illustrative purpose and provide reference points to evaluate the urgency of protecting against drifts or slides towards Dark Corners. These scenarios would then aid the Projection Coordinator in building a clear narrative, communicating policy, and producing a first-rate policy report.
- **Submission of Final Case A B Scenarios:** The Projection Coordinator submits final Case A and Case B scenarios to the Board three days in advance of the Policy Decision. Once these scenarios have been submitted as final, they would not be subject to any further changes.
- **Policy Decision:** Against the backdrop of the prior 27 days’ lively discussions and debates of the ingredients, along with the submission of the final Case A and Case B scenarios, Board members would be able to propose their policy decision. As part of the decision-making process, board members would make submissions that include: the policy action they propose; how that action connects to what they believe may happen in the future and its ensuing policy implications; and their commitment to changing course if new information arises. The Board’s decision would be announced in tandem with issuance of the Monetary Policy Report, which would clearly communicate through a *narrative approach* the Board’s decision with reference to the scenarios and ingredients considered by policymakers to be most relevant to the current situation and its uncertainties.
- **Reassess Risks:** Following the decision and its announcement, a reassessment of the most relevant risk scenarios would be made, to continue the process.

C The Characteristics of Candidate Scenarios (The Three R’s)

Candidate scenarios should be:

- **Related to the current data:** Be relevant to the current policy situation, in the sense of being connected to the current conjuncture as described by the data (and reasonable interpretations thereof). Initial and underlying conditions of the economy are subject to a wide range of interpretation; the uncertainty associated with this range of interpretation is a key reason for constructing scenarios.
- **Realistic:** Be realistic, in that “it could happen,” even if does not have the highest likelihood. The key is to have *relevant* (see below) and *realistic* reference points for the risk analysis that describe the potential range of behavioral responses to the current situation—in other words, possibilities

worth thinking though in advance of them being realized. This approach would replace the misguided search for exact and detailed forecasts around which specific plans are made.

- **Relevant for Policy:** Reflect policymakers’ fears about what policy might be confronted with over the next few years. Where the risk of sliding towards a dark corner has become a notable concern, a scenario describing such an evolution would be consistent with risk minimization on a least regrets or other basis.

In order to conduct MPRM in a structured and communicable way, we propose creating a standard set of scenarios labeled as Case A, Case B, and Case X (Y) type scenarios:

- **Case A:** scenarios where the *policy rate path would need to be higher* than what the market currently expects. In other words, a plausible hawkish scenario.
- **Case B:** scenarios where the *policy rate path would need to be lower* than what the market currently expects. In other words, a plausible dovish scenario.
- **Case X(Y):** *tail risk scenarios* as well as scenarios that incorporate avoiding the Dark Corners of monetary policy; high and variable inflation, or a low inflation trap.

D A Paradigm Shift

It is useful to note that the structural change of FPAS Mark II is not simply doubling the number of scenarios and slightly changing the vocabulary or branding. In other words, we are not simply replacing the current Mark I task of getting the Board to reach a consensus on one “baseline” scenario with reaching a consensus on two “case” scenarios. The proposed shift to incorporate MPRM thinking in policymaking, aided by a scenario-based approach, represents a paradigm shift in the mindset of how monetary policy is made.

Scenario-Based Approach

The proposed approach shifts the focus from forecasting an unpredictable future to exploring the policy implications of different possible futures, using multiple reference scenarios that are chosen for their relevance to the current situation and its risks. Most importantly, however, it does away with the folly of trying to reach a consensus among members of the Board. While only a small handful of central banks explicitly target consensus as an operational objective, the concept of “baseline scenario” inherently requires boards of central banks to reach a consensus in order to determine the *optimal policy path for the most-likely future*. This consensus-based decision-making approach is inimical to the

mission of monetary policymaking. The inbuilt drive towards a singular institutional view sets up a dynamic that presumes that a singular best outcome can be reached with some certainty, diverting attention from, or shutting out, reasonable alternative perspectives. Undesirable group dynamics, especially those associated with groups operating in situations of uncertainty but feeling compelled to act with certainty, may be encouraged. Creative and independent thinking could be completely stifled.

FPAS Mark II’s shift to a scenario-based approach transforms this decision-making structure. Because the Case A and B scenarios are not prescriptive forecasts of the future, but rather, tools for illustrating risk management, the need to reach a consensus is reduced significantly. As a result, the emphasis is placed on fostering a culture of lively debate and discussion. Board members who buy into this approach to FPAS Mark II take as a given that not all of their ingredients—perhaps none of them—will make it into the Case A and B scenarios, but this fact does not diminish their role in the decision-making process. Those ingredients that aren’t part of the two scenarios remain critical to the process, as they continue to be key drivers of debate and discussion. In this context, board members are not tied down to any one scenario, and the flexibility and transparency that this approach provides ensures that the chances for groupthink are meaningfully lessened.¹⁷ The ultimate objective is to create a safe zone for Board members with different backgrounds to express the main concerns and risks they have in mind.

Policymaking Round

The 28-day policymaking round has the potential to reshape not just how policy is made, but also, how central banks hire and train staff. Typically, central banks spend two months in each quarter engaged in the policymaking round, meaning that eight months of the year are spent in a high-stress setting that demands a near total commitment of time and resources by the staff. While this has come to be accepted as “par for the course” in central banking, this approach tends to place enormous burdens on monetary policy staff, consistently requiring long hours and high degrees of stress, making work-life balance difficult, if not impossible, to achieve for most of the year. As a result, individuals who may be extremely well qualified for these roles but who value work-life balance—in particular, those who want to start families or raise children—are essentially excluded from the field of monetary policy. Condensing these policymaking rounds to 28-day cycles reduces the intensive period of the process to four months, and the greater efficiency and flexibility in workflow that this process enables reduces some of the unnecessary stress of the process. This enables a greater emphasis on work-life balance within monetary policy teams, without an attendant reduction in standards, team quality, or level of commitment. On the contrary, as the following subsection illustrates, the FPAS Mark II setup will be characterized by a dramatic investment in human capital and building the technical and critical thinking abilities of the *entire* team. With a

¹⁷See upcoming paper by Kostanyan et al (2023a-b).

larger (and potentially smarter) pool of candidates to draw from, and with an institutional approach to training and dynamic learning in place, this system could meaningfully improve the quality of monetary policy teams.

E The Role of the Team

FPAS Mark II marks an important shift in how central banks invest into their human capital. Some of the major human capital issues facing even the best central banks in the world include poor mentoring habits and a superficial emphasis on training. The major focus of an FPAS Mark II central bank should be investing serious resources into developing their human capital, and equipping this team with the resources, training, and relationships necessary to support this policymaking framework.

The centerpiece of this approach is the creation of a “Dynamic Learning Environment” (DLE), which conceives of learning as a dynamic and lifelong process rather than a one-shot game. Through a Training, Coaching, and Collaboration Program (TCCP), all team members would participate in dedicated (and productive) training sessions and workshops, coach or be coached (depending on seniority), and enmesh themselves into a culture that truly prioritizes collaboration. Importantly, this requires team members to make a commitment to growth and change, and supplement their own growth with as much knowledge-sharing and collaboration as possible. One example of TCCP in practice is the Global Forecasting School’s and Dilijan Training Center’s quarterly workshops, which take place at the beginning of each quarter and follow a seven-week format (one week of pre-GFS, two weeks of GFS, and one month of advanced GFS). The Workshops would provide an arena for students to take on major economic issues of the day in formats that are particularly relevant for macroeconomists: rigorous interviews, on-the-spot writing assignments, and presentations. This would allow team members to not only interact with important economic issues and current events, but more importantly, learn how to think critically and “on their feet” about these ideas and how to communicate them. This would be supplemented by robust trainings on key models (e.g. ENDOCREG, mixed-frequency models, DSGE, etc.) and programming languages (Python, R). With workshops and other resources like this in place, the Dynamic Learning Environment within FPAS Mark II central banks would become an “incubator” for knowledge, where team members continuously bounce ideas off one another and challenge each other to grow.¹⁸

With rigorous training and continuous learning as a critical requirement of the job, the DLE program is designed to build superstars. This approach helps resolve some of the major human resources challenges that central banks face, which can stifle growth prospects and increase burdens on well-performing team members. Central banks that fail to provide comprehensive training environments and cultures of learning set up their employees to fail. These untrained

¹⁸See Avagyan et al (2023a, f, k, p).

employees not only feel that the bank is not providing them with adequate resources, but also, can serve as a burden on well-trained employees who have to pick up their slack. A central bank cannot be best-in-class unless its employees are well trained, motivated, and not overburdened—and most importantly, are in the type of setting that incentivizes and feeds their appetite for learning and growth.

6 An Application: Summer 2021

This section provides a concrete illustration of this scenario-based MPRM approach. Taking the summer of 2021 as the subject period for this discussion, we present retrospectively-constructed scenarios that might have been developed using this approach during this time period. The example workhorse model described in Section 5 is used for scenario generation. We reimagine what the analytics would look like for the Fed during the late-Covid period, while recognizing that we may be affected by hindsight. However, the scenarios we present were actively being discussed qualitatively, at least in part, at the time. By selecting scenarios and using a model with specific non-linear dynamics relevant to the policy problems at hand, we seek to illustrate the feasibility of the proposed approach in a period of heightened uncertainty.

We imagine that the FOMC would have chosen the following scenarios capturing relevant risks:¹⁹

- Case A: the possibility that inflation would turn out to be persistent, in the context of a continuing recovery of demand;
- Case B: the chance that, on the other hand, inflation is transitory, driven by temporary supply-side factors;
- Case X: the possibility of stagflationary shocks, which further harm credibility.

To elaborate:

Case A: Inflation is persistent.

In the context of the large fiscal stimulus bill in early 2021, people like Lawrence Summers argued that the combined fiscal and monetary stimulus was too big. In particular, the primary concern that this camp voiced was that aggregate demand was already pushing up against aggregate supply, and thus translating into

¹⁹See Papikeyan et al (2022a-b, 2023a-h). The Global Forecasting School will be issuing a series of papers in the week preceding each FOMC meeting titled “Not the Teal Book,” which would present Case A and Case B scenarios and the types of policy changes the FOMC might consider in this framework. The CBA conducts a quarterly projection exercise; beginning in January 2023, these shadow projections will be published on a quarterly basis. See Avagyan et al (2023b, g, l, q). The FPAS Mark II framework is also being extended to include financial stability, starting with regular updates of credit gaps and measures of the financial cycle gaps. See Avagyan et al (2022b, 2023e, j, o, t).

higher inflation. Indeed, core inflation had been accelerating for several months entering into the summer season, spurring intense debates about whether inflation was going to be persistent or transitory. Against this background, the Case A scenario reflects the school of thought that believed at the time that core inflation was going to remain elevated due to these concerns, requiring a faster lift-off of interest rates to cool demand and keep core inflation from further ratcheting upwards.

Case B: Inflation is transitory.

Others argued that supply-side factors connected to the COVID-era economy of supply-chain disruptions were the main contributor to the rise in inflation. Therefore, given what was assumed to be the temporary nature of these supply-chain disruptions, inflation was expected to peter out over the coming months. Thus, the policy rate path could normalize in line with a still-recovering labor market, which hadn't materially crossed the NAIRU threshold, where it would be considered tight. Additionally, some policymakers' preference for this scenario at the time may also reflect their reasonable fear that a pre-emptive tightening of monetary policy to get ahead of inflation could have easily thrown a still recovering and fragile economy back into a deflationary environment—precisely the type of situation that policymakers had spent over a decade trying to escape.

Case X: Stagflationary shock.

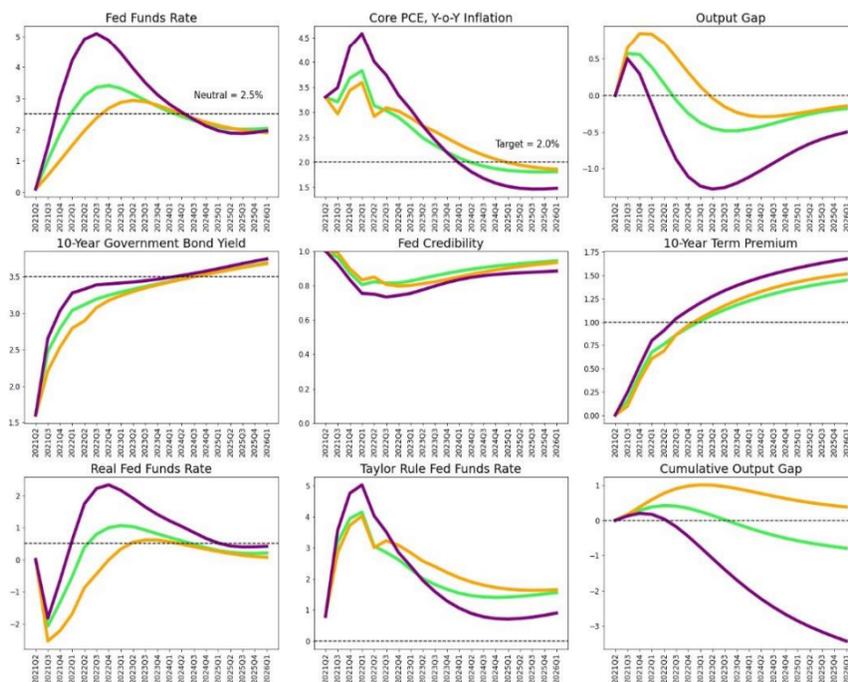
Both Case A and B anticipated higher inflation, at least temporarily, but not enough to threaten to de-anchor longer run inflation expectations, even under Case A. A relevant tail risk, already under discussion in some quarters, was that the Fed would get sufficiently far behind the curve that monetary stimulus would increase alongside rising medium term inflation expectations, creating an increasing chance of de-anchoring, especially given signs of real wage pressures coming from a still hot labor market. The compounding of the gap between actual and warranted policy settings would weaken credibility and progressively ramp up the scale of the eventual policy response needed, creating a growing risk of stagflation.

The three corresponding scenarios are plotted in Figure 3.

The question arises as to whether publishing multiple scenarios on which the central bank describes itself to face uncertainty, rather than a single forecast to which a degree of certainty is (naturally, if not intentionally) attached, would itself weaken central bank credibility. This question is addressed in the next section, describing the nature of the communications framework that would be needed for MPRM through scenario analysis.

It is worth noting that we do not use the benefit of hindsight to advocate for the salience of the framework. Not to suffer from the same folly we are trying to avoid, it is, of course, possible that the Case B scenario whereby inflation was more transitory would turn out to be more realistic. In addition, most of the market commentators and participants in the Summer of 2021 would dismiss the Case X scenario, where Fed Funds Rate reaches 5 percent. The fundamental value added of communicating these scenarios, however, is that the Fed would

Figure 3: Key Metrics for Case A, Case B, and Case X Scenarios



Source: Archer, Galstyan, Laxton (2022)

have clearly signaled that it is prepared to adjust its instruments sufficiently aggressively should the risks described in case X materialize. This communication with the markets would then significantly reduce the risk of taper tantrum, limit the loss of credibility and eventually allow the Fed to move more aggressively, because it would refer to these published scenarios.

7 The Communication Framework

Central bank policy communications have undergone considerable change over the past century. The direction of travel towards greater transparency was, for a time, remarkably consistent, but the trend has recently begun to reverse. Following the adoption of fiat currencies and the birth of active monetary policy in the first part of the 20th century, policymaking continued to be shrouded in mystery. The communications approach of this early period is best illustrated by Bank of England Governor Montague Norman's reported motto to "never explain, never apologize." In time, banks came to realize that expectations and credibility were essential to policy outcomes, and that their newly acquired autonomy in decision-making carried obligations to transparency and disclosure. Communicating policy rationale and intentions became the norm, and communication strategies radically transformed from an opaque, "doctor knows best" approach to one that recognized openness and transparency as powerful instruments of policy. Central banks increasingly began opening up historically-off-limits elements of policymaking, such as the scope and breadth of policy discussions (or, in the case of Sveriges Riksbank and more recently the Czech National bank, the attributed contributions of individual board members) to the public, with the aim of assisting financial markets to better understand the decision-making process. More recently, many central banks have recognized that because their accountability is to the public, a communications approach that primarily targets financial markets is still imperfect. Efforts to broaden the target audience of central bank communications are now underway in most jurisdictions.

The instrumentalization of communications, however, has run into the problem of uncertainty that is at the core of this paper. These generalized indications of policy direction and bias that became commonplace during the 1990s and early 2000s also came to dominate central bank communications. Almost all central banks have placed discussion of the policy outlook at the center of their communications, even if few central banks went as far as to emphasize quantitative policy projections (routine forward guidance). But, as noted extensively in Section 2, this growing tendency to project the future of policy has led to increased inertia regarding not only indications of policy direction, but also, central banks' understanding of policy needs. Recognition lags and inaction biases have been transmitted through words as well as actions, with policy setting errors (quantitatively or qualitatively) amplified by projecting wrong policy paths forward over the years ahead. In the process, the instrumentalization of

communications morphed into forms of forward guidance that placed increasing stress on knowledge of the (singular) most likely future, knowledge that central banks do not possess.

The beginnings of a reversal in the trend towards greater openness and the instrumentalization of communications can be seen with a downplaying of policy’s forward-lookingness. This is best exemplified by the Fed’s dismissal of policy pre-emptiveness, instead adopting “data dependency” as the prime characterization of policymaking.²⁰ In the absence of clear statements of policy strategy, however, “data dependency” is not very different from discretionary policy. Despite the fact that objectives have been stated (albeit with only some elements having been given quantitative form), without there being a quantified strategy or “contingency plan” (Taylor 2017), there is little basis on which the public can judge the intended use of the policy discretion that is delegated to the central bank, or assess its performance. The legitimacy purpose of communications is thus undermined.

Any proposal for treating uncertainty more seriously in monetary policymaking, such as this paper’s proposal for MPRM through scenario analysis, must therefore address both the instrumental and legitimacy needs of communications, in the context of central bank independence. Disclosure of reference scenarios that policymakers consider in the course of reaching their risk-based decision, together with their scenario-consistent policy paths, is consistent with both needs. With these reference points developed to enable the evaluation of currently-relevant policy risks, the mechanics of explaining decisions in terms of the policymakers’ risk analysis flows naturally.

The features of this communications approach that reinforce the efficient transmission of policy and buttress legitimacy include the following:

- By presenting scenarios containing policy paths that are styled as contingency plans (what-ifs), the central bank is able to discuss policy settings that are at a (perhaps considerable) distance from current ones, without necessarily suggesting that such a path is the current expectation. This communications framework enables a non-prescriptive discussion of potential significantly-changed policy settings, which helps to reduce the type of hesitancy to modifying policy that is caused by a lack of forewarning. In other words, in the event that such policy changes become necessary, the bank would not be constrained by previous communications that placed excessive emphasis on one baseline and narrative. This is a notable shift from the overly prescriptive approach of central bank communications, where the inability to communicate contingencies partially limits the policy tools available at the bank’s disposal. In a world of significant uncertainty where the future is essentially unknowable, such a policy and communications strategy would, relative to current strategies, be expected to result in a wider distribution of expected policy variables, while ensuring a tighter distribution of policy outcomes around objectives.

²⁰See Powell (2022).

- The policy strategy would be presented through the publication of scenario-consistent policy paths. Most importantly, these policy paths would be supported by accompanying *narratives* that highlight the connections between the macroeconomic stability risks present in scenarios, as well as their policy imperatives. Revealing the strategy through quantified and narrated examples, rather than via the algebra of policy reaction or loss functions, provides concreteness and improves accessibility. This is especially relevant for those non-expert agents that are important to both price setting and endorsing the continuation of existing institutional arrangements.
- By being more suited to a world characterized by significant policy uncertainty, a communications approach that drops the focus on a “most likely” future in favor of recognition of an uncertain one might, counter-intuitively perhaps, facilitate the retention of credibility. While the public undoubtedly has a preference for certainty and assurance, prescriptively focusing on a “most likely” future can only provide a false sense of certainty and assurance. Moreover, protected public officials who make unrealistic claims of expertise may play into populist narratives about elites having too much influence, and ultimately serve to threaten the valuable institutional structures created to depoliticize policymaking. At the same time, this false signaling to financial markets about the most probable paths of market-relevant policy variables risks crowding out private information, and may create the false impression that the central bank is guiding markets.
- Communications frameworks also require transparency on the analytics that lie behind the policy discussion that occurs at the policy board and that is shared with the public. In spite of the additional complexities associated with MPRM mainly related to nonlinearities, the availability of open source software such as DYNARE-JULIA provides the possibility for high levels of transparency and accountability in this regard. An important goal of the DTC is to develop GUI-based front ends that will allow those inside and outside the central bank to replicate the scenarios published by the Central Bank of Armenia (CBA), as well as enable users to consider alternative assumptions and narratives. Importantly, the process will also include real-time and online model documentation, which will represent a significant improvement in technical transparency over FPAS Mark I central banks. In particular, this process will eliminate the issue of enormous publication lags, where model documentation in many cases can fall years behind changes in the modelling assumptions—see Kostanyan and others (2022b). To be more precise, these elements of policy transparency are applicable to FPAS Mark I as well. FPAS Mark II, however, is more efficient, because by saving enormous amount of resources from the elimination of consensus seeking around the baseline scenario, it frees up resources to focus on timely and transparent communication, such as elimination of publication lags.

8 Challenges and Risks

The innovations proposed in this paper come with identifiable challenges and a number of unknowns. The main points—along with tentative answers—are discussed briefly in this section.

A Acknowledging and Explicitly Addressing Uncertainty

We argue for making the presence and implications of uncertainty more explicit in the policy process, internally and externally. (The discussion of internal issues is deferred to Section 8c). For FIT central banks that currently publish policy projections, the change would be particularly visible: “most likely” forward policy paths would no longer be published, instead replaced by scenarios whose absolute probability cannot be stated and whose relative probability can only be addressed in qualitative terms. Concern will arise that this would amplify uncertainty and volatility in financial markets. More generally, concern will arise that this approach would not be able to satisfy public, press, and market demands expert assurance.

These are undoubtedly relevant considerations, and are especially relevant for the transition phase until financial market participants have fully understood the implications of the new framework. However, the ultimate question is whether the current practice is sustainable. The poor record of policy predictions, and the possible amplification of macroeconomic cycles caused by policy inertia stemming in part from an excessive focus on the “most likely,” might not provide sufficient credibility and legitimacy to support a continuation of depoliticized monetary policy. A fallback is available in the form of simply linear policy rules, but that fails to address policy nonlinearities that have proven to be highly relevant. Another fallback is available in constrained discretion strategies, where the constraint comes in the form of clearly stated objectives. But the history of recent strategy reviews highlights the difficulty of clearly articulating what such objective statements actually mean for the use of delegated policy powers in different circumstances.²¹ In short, we believe that there is a tradeoff between short-run financial market volatility—which can be comparatively easily hedged, especially after allowing for endogenous structural responses to it—and longer-run macro volatility, which is more difficult to hedge.

B Attempting to Quantify the Implications of (Multiple) Nonlinear Processes

A key thread running through our argument is the idea that the monetary policy world is importantly nonlinear, and that the welfare consequences of

²¹The Fed’s post-review interpretation of its objective function as calling for an employment-first, non-preemptive approach might have been valid in a world with a structurally-determined flat Phillips Curve insensitive to inflation variations and with fixed high credibility of the inflation target, but quite a different approach was called for within months.

activist monetary policymaking hinge on dealing successfully with these nonlinearities. Dark Corner risks dominate welfare outcomes in the relevant world, and adequately incorporating nonlinearities presents the best path forward for addressing these risks. Moreover, the linear, non-standard world of the Great Moderation does not require expertise to play an active, tactical role.

Yet nonlinear modelling is not well advanced. Linearization for tractability is standard. Nonlinear processes are especially difficult to calibrate, and requires “outside the box” thinking to create appropriate modeling representations of these processes. It may appear that the present limitations in calibrating multiple simultaneous processes is stretching our capacity.

While this poses a limitation at present, it is important not to overstate this point. While nonlinearities can be more difficult to model than simple linearities, policymakers do not have the luxury of merely avoiding this problem and failing to deal with the challenges posed by nonlinearities. Our Global Forecasting School (GFS) experiences thus far in replaying historical periods of great uncertainty—such as pre-Global Financial Crisis, GFC itself, and the summer of 2021—demonstrate the clear benefits of models with endogenous credibility that incorporate treatment of nonlinearities. The GFS students, advisors, and policymakers suggest a list of possible topics and models to explore. This list will be updated and published monthly on the GFS-DTC website.

C Confronting Policy Decision-Makers with so Many Unknowns

Monetary policy decision-making by committee is not a straightforward process (see, for reference, Blinder 2005). Reaching agreement might be aided by the availability of a starting point (such as a proposal for the decision), or an attractor (such as the perspective of the most respected person in the group). These “aids” to reaching agreement are also, however, facets of undesirable group dynamics. These “aids” to reaching agreement, however, also represent facets of undesirable group dynamics. They limit the range of arguments that may be discussed and can lead to groupthink, as the group is often biased in favor of the opinion of the most vocal or respected member, perhaps even regardless of the merits of his or her argument.

Asking a policy board to identify, then participate in the evaluation of, multiple possibilities, and subsequently make a risk-based assessment, might seem particularly challenging. Nonetheless, having in place a system that seeks to avoid groupthink has clear benefits. Confronting the inherent uncertainty of policymaking is preferable to allowing cognitive biases drive towards conclusions that the group feels compelled to hold with unreasonable certainty. We suggest that a focus on reasonable scenarios that serve as useful reference points for a risk analysis, rather than on the (singular) most likely outcome, will allow differences of view in the decision group freer rein and thereby aid policy agility.

9 Concluding Remarks from Governor Galstyan

Establishing FPAS Mark II at the Central Bank of Armenia is a critical priority for the Board of the CBA. The Central Bank of Armenia’s vision, set forth in its 2021 Strategy ²² is “to be a leading central bank based on cutting-edge research and innovative solutions.” Developing FPAS Mark II is a natural extension of this vision, but it is not a recent idea. Over the past five years, there have been long-standing conversations and debates taking place among the CBA’s leadership about the need to move away from baseline-scenario-dominated thinking and develop new frameworks that better deal with risk and uncertainty.

Through this endeavor, we hope to proactively address among the most fundamental challenges facing central banks around the world: uncertainty. The existing FPAS Mark I framework is useful for providing a systematic strategy for analyzing and describing policy choices,²³ but it remains vulnerable to addressing questions of uncertainty. It is the Board’s view that eliminating FPAS Mark I’s folly in baseline scenarios and local approximations, and incorporating MPRM thinking, remains the best solution for the CBA—and central banks around the world—to adequately deal with uncertainty, especially because the policy-relevant future cannot be known. By adopting a scenario-based, risk management approach, we shift away from trying to predict “most likely” outcomes, and instead focus on being able to deal with situations of significant uncertainty. Importantly, this would also serve to increase the credibility of the central bank. Because the baseline scenario approach places virtually all credibility at stake (as credibility is contingent on the ability to make accurate forecasts, which rarely, if ever, happens), moving toward a risk management-based approach eliminates this unnecessary danger to central bank credibility. Reaching this consensus among the Board was admittedly not a simple or easy task. Significant time was spent discussing, debating, and analyzing the disadvantages of baseline scenarios and the merits of MPRM, which ultimately laid the foundation for FPAS Mark II. But with this framework now in place, we are approaching the critical stage of implementation, which raises its own series of questions and challenges. What is it going to take for the CBA to successfully implement FPAS Mark II? What type of human capital do we need to—or can we—attract? What will the relationship between the decision-makers and staff look like?

Our approach to these challenges is holistic. In implementing FPAS Mark II, we have the opportunity to meaningfully improve the output of policymakers by eliminating the folly in baseline scenarios and local approximations. But this seemingly top-level transformation has significant downstream effects. Changes in our workstream and output processes will eliminate the inefficiencies inherent to many central banks: long hours, limited (if any) work-life balance, bureaucratic enmeshment, low transparency, among others. With these barriers to

²²Refer to <https://www.cba.am/EN/analyticalmaterialsresearches/StrategyCBA2021.pdf>.

²³For a systematic discussion of the FPAS Mark I framework in the context of transparency and credibility, see Kostanyan et al (2022).

quality of life and work removed, the CBA can dramatically increase the pool of people—both in terms of quality and quantity—who could be involved in the development and implementation of FPAS Mark II. Investing in this human capital will be key. We are creating a dynamic learning environment where learning is prioritized, where real resources and time are allocated for this purpose, and where stagnation isn't tolerated.

It is important to emphasize that the downstream effects of FPAS Mark II aren't limited to just the CBA. The cadres that we develop and train through FPAS Mark II will, in due course, leave the CBA and continue their careers in other fields, from the private sector to academia to media/journalism. The presence of Mark II-trained economists across many critical institutions will have enormous network effects and positive impacts on the economic and financial literacy and capabilities of these institutions and the broader public. Rather than overly relying on the CBA as the sole source of thinking on major economic and financial issues, these institutions would have the human capital necessary to do this thinking themselves, enriching the public discourse and introducing important and potentially adversarial ideas. The ultimate goal of the implementation of FPAS Mark II—and the resulting impacts on human capital and capabilities inside and outside of the CBA—is to improve the welfare of all Armenian citizens. It is with this mission of social responsibility in mind that we enthusiastically present the FPAS Mark II system.

References

- [1] Acheson, K., and J. Chant. 1973. "Bureaucratic Theory and the Choice of Central Bank Goals." *Journal of Money, Credit and Banking* 5 (2): 637–55.
- [2] Alich, A., K. Clinton, C. Freedman, M. Juillard, O. Kamenik, D. Laxton, J. Turunen, and H. Wang. 2015. "Avoiding Dark Corners: A Robust Monetary Policy Framework for the United States." IMF Working Paper 15/134, International Monetary Fund, Washington, DC.
- [3] Angeloni I., Coenen G. and Smets F., "Persistence, the transmission mechanism and robust monetary policy," *Scottish Journal of Political Economy*, vol 50, no 5, 2003, pp 527–49
- [4] Alsterlind, J. 2017. "Common features in short maturity interest rate forecasts." Staff memo, Sveriges Riksbank.
- [5] An Z., J. Jalles and P. Loungani, 2018, "How Well Do Economists Forecast Recessions?" IMF Working Papers 2018/039, International Monetary Fund.
- [6] Avagyan V., H. Avetisyan, M. Galstyan, M. Gevorgyan, E. Hovhannisyan, H. Igityan, J. Gilbert, H. Karapetyan, Kostanyan A., D. Laxton, J. Laxton, A. Matinyan, A. Nurbekyan, A. Papikyan, and H. Tarverdyan., 2022a, "FPAS Mark II Monetary-Policy-Relevant Output Gaps, November 2022," Forthcoming CBA Working Paper, November 2022.
- [7] Avagyan, V., ———, 2022b, "FPAS Mark II Financial-Cycle Gaps, December 2022," Forthcoming CBA Working Paper, December 2022.
- [8] Avagyan, V., ———, 2023a, "FPAS Mark II: Better Work-Life Balance Issues, January 2022," Forthcoming CBA Working Paper, January 2023.
- [9] Avagyan, V., ———, 2023b, "FPAS Mark II: Armenia Shadow Projection, January 2023," Forthcoming CBA Working Paper, January 2023.
- [10] Avagyan, V., ———, 2023c, "FPAS Mark II Monetary-Policy-Relevant Output Gaps, January 2023," Forthcoming CBA Working Paper, January 2023.
- [11] Avagyan, V., ———, 2023d, "FPAS Mark II Financial-Cycle Gaps, January 2023," Forthcoming CBA Working Paper, January 2023.
- [12] Avagyan, V., ———, 2023e, "FPAS Mark II Credit Gaps, January 2023," Forthcoming CBA Working Paper, January 2023.
- [13] Avagyan, V., ———, 2023f, "FPAS Mark II: Better Work-Life Balance Issues, April 2023," Forthcoming CBA Working Paper, April 2023.
- [14] Avagyan, V., ———, 2023g, "FPAS Mark II: Armenia Shadow Projection, April 2023," Forthcoming CBA Working Paper, April 2023.

- [15] Avagyan, V.,——, 2023h, "FPAS Mark II Monetary-Policy-Relevant Output Gaps, April 2023," Forthcoming CBA Working Paper, April 2023.
- [16] Avagyan, V.,——, 2023i, "FPAS Mark II Financial-Cycle Gaps, April 2023," Forthcoming CBA Working Paper, April 2023.
- [17] Avagyan, V.,——,2023j, "FPAS Mark II Credit Gaps, April 2023," Forthcoming CBA Working Paper, April 2023.
- [18] Avagyan, V.,——,2023k, "FPAS Mark II: Better Work-Life Balance Issues, July 2023," Forthcoming CBA Working Paper, July 2023.
- [19] Avagyan, V.,——, 2023l, "FPAS Mark II: Armenia Shadow Projection, July 2023," Forthcoming CBA Working Paper, July 2023.
- [20] Avagyan, V.,——, 2023m, "FPAS Mark II Monetary-Policy-Relevant Output Gaps, July 2023," Forthcoming CBA Working Paper, July 2023.
- [21] Avagyan, V.,——, 2023n, "FPAS Mark II Financial-Cycle Gaps, July 2023," Forthcoming CBA Working Paper, July 2023.
- [22] Avagyan, V.,——,2023o, "FPAS Mark II Credit Gaps, July 2023," Forthcoming CBA Working Paper, July 2023.
- [23] Avagyan, V.,——,2023p, "FPAS Mark II: Better Work-Life Balance Issues, October 2023," Forthcoming CBA Working Paper, October 2023.
- [24] Avagyan, V.,——,2023q, "FPAS Mark II: Armenia Shadow Projection, October 2023," Forthcoming CBA Working Paper, October 2023.
- [25] Avagyan, V.,——,2023r, "FPAS Mark II Monetary-Policy-Relevant Output Gaps, October 2023," Forthcoming CBA Working Paper, October 2023.
- [26] Avagyan, V.,——, 2023s, "FPAS Mark II Financial-Cycle Gaps, October 2023," Forthcoming CBA Working Paper, October 2023.
- [27] Avagyan, V.,——, 2023t, "FPAS Mark II Credit Gaps, October 2023," Forthcoming CBA Working Paper, October 2023.
- [28] Ball, L. 2014. "The Case for a Long-Run Inflation Target of Four Percent." IMF Working Paper 14/92, International Monetary Fund, Washington, DC.
- [29] Bank of Canada. 2011. "Renewal of the Inflation-Control Target: Background Information," November.
- [30] Barro, R., and D. Gordon. 1983. "Rules, Discretion, and Reputation in a Model of Monetary Policy." *Journal of Monetary Economics* 12 (1): 101–21.
- [31] Batini, N., and D. Laxton. 2007. "Under What Conditions Can Inflation Targeting Be Adopted? The Experience of Emerging Markets." In *Monetary Policy Under Inflation Targeting*, edited by F. S. Mishkin and K. Schmidt-Hebbel. Chile: Banco Central de Chile.

- [32] Batini, N., K. Kuttner, and D. Laxton. 2005. “Does Inflation Targeting Work in Emerging Markets?” Chapter 4 of the September 2005 World Economic Outlook, International Monetary Fund, Washington, DC.
- [33] Bekaert G., Hoerova M. and Duca M. Lo, “Risk, uncertainty and monetary policy,” *Journal of Monetary Economics*, vol 60, no 7, pp 771–88.
- [34] Berg, A., P. Karam, and D. Laxton, 2006, A Practical Model-Based Approach to Monetary Policy Analysis Overview, IMF Working Paper 06/080 (April 2006).
- [35] Berg, A., P. Karam, and D. Laxton, 2006, Practical Model-Based Monetary Policy Analysis A How-to Guide, IMF Working Paper 06/081 (April 2006).
- [36] Bernanke, B. S., T. Laubach, F. S. Mishkin, and A. S. Posen. 1999. *Inflation Targeting: Lessons from the International Experience*. Princeton, NJ: Princeton University Press.
- [37] Blanchard, O., G. Dell’Ariccia, and P. Mauro. 2010. “Rethinking Macroeconomic Policy.” IMF Staff Position Note 10/03, February. International Monetary Fund, Washington, DC.
- [38] Blinder, A., 2005. “Monetary Policy by Committee: Why and How?” CEPS Working Paper 118, Griswold Center for Economic Policy Studies, Princeton, NJ.
- [39] Bordo M. and M. Levy, 2022, “The Fed’s Monetary Policy Exit Once Again Behind the Curve,” Hoover Monetary Policy Conference, Hoover Institution, Economics Working Paper 22110, May 6, 2022.
- [40] Bullard J., 2021, “A Risk Management Approach to Monetary Policy,” Federal Reserve Bank of St. Louis.
- [41] Caggiano, G., Castelnuovo E. and Nodari G., “Uncertainty and monetary policy in good and bad times,” *Melbourne Institute Working Papers*, no 9/17, 2017.
- [42] Clinton, K., C. Freedman, M. Juillard, O. Kamenik, D. Laxton, and H. Wang. 2015. “Inflation-Forecast Targeting: Applying the Principle of Transparency.” IMF Working Paper 15/132, International Monetary Fund, Washington, DC.
- [43] Clinton, K., T. Hlédik, T. Holub, D. Laxton, and H. Wang. 2017. “Czech Magic: Implementing Inflation-Forecast Targeting at the CNB.” IMF Working Paper 17/21, International Monetary Fund, Washington, DC.
- [44] Coats, W., D. Laxton, and D. Rose. 2003. *The Czech National Bank’s Forecasting and Policy Analysis System*. Prague: Czech National Bank.
- [45] Coenen G., “Inflation persistence and robust monetary policy design,” ECB Working Paper Series, no 290, 2003.

- [46] Dupraz S., Guilloux-Nefuss S., and Penalver A., “A pitfall of cautiousness in monetary policy,” Bank of France Working Papers, no 758.
- [47] Engen E., Th. Laubach and D. Reifschneider, 2015, ”The Macroeconomic Effects of the Federal Reserve’s Unconventional Monetary Policies,” Finance and Economics Discussion Series 2015-5, Board of Governors of the Federal Reserve System (U.S.).
- [48] Evans C., Fisher J., Gourio F., and Krane S., “Risk management for monetary policy near the zero lower bound,” Brookings Papers on Economic Activity, Spring 2015.
- [49] Fischer, S. 1995. “Modern Approaches to Central Banking.” NBER Working Paper 5064. National Bureau of Economic Research, Cambridge, MA.
- [50] Freedman, C., and D. Laxton. 2009. “Inflation Targeting Pillars: Transparency and Accountability.” IMF Working Paper 09/262, International Monetary Fund, Washington, DC.
- [51] Freedman, C., and D. Laxton. 2009. “Why Inflation Targeting?” IMF Working Paper 09/86, International Monetary Fund, Washington, DC.
- [52] Hawkesby, C. 2021. “A least regrets approach to uncertainty: hawks, doves, and the white heron (he Kōtuku).” Speech at Reserve Bank of New Zealand, September 15.
- [53] Issing O., “New monetary policy guidelines: losing the anchor?” mimeo, 2022.
- [54] Kostanyan A., A. Matinyan, A. Papikyan, V. Avagyan, H. Avetisyan, M. Galstyan, M. Gevorgyan, E. Hovhannisyanyan, H. Igityan, J. Gilbert, H. Karapetyan, D. Laxton, J. Laxton, A. Nurbekyan, and H. Tarverdyan., 2022, ”Getting FIT with Imperfect Policy Credibility. DYNARE/JULIA Workshops with an Application for the US Economy,” Forthcoming CBA Working Paper, October 2022.
- [55] Kostanyan A., D. Laxton, J. Romero, V. Avagyan, H. Avetisyan, M. Gevorgyan, E. Hovhannisyanyan, H. Igityan, M. Galstyan, J. Gilbert, H. Karapatan, J. Laxton, A. Matinyan, A. Nurbekyan, and H. Tarverdyan, 2022, ”FPAS Mark I Central Bank Transparency and Credibility Measures,” Forthcoming CBA Working Paper, October 2022.
- [56] Kostanyan A., D. Laxton, J. Romero, V. Avagyan, H. Avetisyan, M. Gevorgyan, E. Hovhannisyanyan, H. Igityan, M. Galstyan, J. Gilbert, H. Karapatan, J. Laxton, A. Matinyan, A. Nurbekyan, and H. Tarverdyan, 2023a, ”FPAS Mark II Central Bank Transparency and Credibility Measures, January 2023” Forthcoming CBA Working Paper, January 2023.

- [57] Kostanyan A., D. Laxton, J. Romero, V. Avagyan, H. Avetisyan, M. Gevorgyan, E. Hovhannisyan, H. Igityan, M. Galstyan, J. Gilbert, H. Karapatan, J. Laxton, A. Matinyan, A. Nurbekyan, and H. Tarverdyan, 2023b, "FPAS Mark II Central Bank Transparency and Credibility Measures, October 2023" Forthcoming CBA Working Paper, October 2023.
- [58] Kydland, F., and E. Prescott. 1977. "Rules Rather than Discretion: The Inconsistency of Optimal Plans." *Journal of Political Economy* 85 (3): 473–92.
- [59] Lane, T. 2015. "Inflation Targeting—A Matter of Time." Bank of Canada, Conference presentation, Halifax, Nova Scotia, October.
- [60] Laxton, D., D. Rose, and A. Scott. 2009. "Developing a Structured Forecasting and Policy Analysis System to Support Inflation-Forecast Targeting (IFT)." IMF Working Paper 09/65, International Monetary Fund, Washington, DC.
- [61] Laxton D. and C. Rhee, 2022a, "Reassessing Constraints on the Economy and Policy: Some Lessons from Unconventional Monetary Policy for Small Open Economies and Emerging Markets," Economic Policy Symposium - Jackson Hole, Federal Reserve Bank of Kansas City.
- [62] Laxton D. and C. Rhee, 2022b, "Implementing Summers' "Adversarial Collaboration" with Scenarios-Based Conventional Forward Guidance," BoK upcoming Working Paper.
- [63] Papikyan, A., V. Avagyan, H. Avetisyan, M. Gevorgyan, E. Hovhannisyan, H. Igityan, M. Galstyan, J. Gilbert, H. Karapatan, A. Kostanyan, D. Laxton, J. Laxton, A. Matinyan, A. Nurbekyan, and H. Tarverdyan, 2022a, "Not the Teal Book," Forthcoming CBA Working Paper, October 2022.
- [64] Papikyan A. and _____, 2022b, "Not the Teal Book, December 2022," Forthcoming CBA Working Paper, December 2022.
- [65] Papikyan A. and _____, 2023a, "Not the Teal Book, January 2023," Forthcoming CBA Working Paper, January 2023.
- [66] Papikyan A. and _____, 2023b, "Not the Teal Book, March 2023," Forthcoming CBA Working Paper, March 2023.
- [67] Papikyan A. and _____, 2023c, "Not the Teal Book, May 2023," Forthcoming CBA Working Paper, May 2023.
- [68] Papikyan A. and _____, 2023d, "Not the Teal Book, June 2023," Forthcoming CBA Working Paper, June 2023.
- [69] Papikyan A. and _____, 2023e, "Not the Teal Book, July 2023," Forthcoming CBA Working Paper, July 2023.
- [70] Papikyan A. and _____, 2023f, "Not the Teal Book, September 2023," Forthcoming CBA Working Paper, September 2023.

- [71] Papikyan A. and _____, 2023g, "Not the Teal Book, October 2023," Forthcoming CBA Working Paper, October 2023.
- [72] Papikyan A. and _____, 2023h, "Not the Teal Book, December 2023," Forthcoming CBA Working Paper, December 2023.
- [73] Poloz, S., 2014. "Integrating Uncertainty and Monetary Policy-Making: A Practitioner's Perspective," Discussion Papers 14-6, Bank of Canada.
- [74] Poloz, S., 2015, "Central Bank Credibility and Policy Normalization." Remarks to Canada-United Kingdom Chamber of Commerce, London, United Kingdom, March 26.
- [75] Poloz, S., 2018, "Let me be clear - from transparency to trust and understanding." Remarks to the Greater Victoria Chamber of Commerce, Victoria, British Columbia, June 27.
- [76] Poloz, S., 2020, "Monetary policy in unknowable times." Speech at Eric J. Hanson Memorial Lecture University of Alberta Edmonton, Alberta, May 25.
- [77] Powell, J., 2018, "Monetary Policy and Risk Management at a Time of Low Inflation and Low Unemployment." Speech at the 60th Annual Meeting of the National Association for Business Economics, Boston, Massachusetts, October 2.
- [78] Powell, J., 2022, "Chair Powell's Press Conference." The Board of Governors of the Federal Reserve System. June 15.
- [79] Svensson, L. E. O. 1997. "Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets." *European Economic Review* 41 (6): 1111-46.
- [80] Svensson, L. E. O., 2001. "The Zero Bound in an Open Economy: A Fool-proof Way of Escaping from a Liquidity Trap." *Monetary and Economic Studies* (Special Edition), February.
- [81] Svensson, L. E. O., 2007. "Monetary Policy and the Interest Rate Path." Speech presented at Danske Bank, Stockholm, August 22.
- [82] Taylor, John B. 1993. "Discretion versus Policy Rules in Practice." *Carnegie-Rochester Conference Series on Public Policy* 39. North-Holland, 1993.
- [83] Weidmann J., "A new age of uncertainty." The Per Jacobsson Foundation Lecture, 26 June 2022, available at Per Jacobsson Foundation Lecture: "A new age of uncertainty? Implications for monetary policy" (bis.org).
- [84] Wieland V., "Monetary policy under uncertainty about the natural unemployment rate: Brainard-style conservatism versus experimental activism," lecture at the Goethe University, March 2006.

- [85] Woodford, M. 2001. "The Taylor Rule and Optimal Monetary Policy." *The American Economic Review* 91 (2): 232–37.
- [86] Woodford M., 2003, "Optimal Interest-Rate Smoothing," *Review of Economic Studies*, Oxford University Press, vol. 70(4), pages 861-886.
- [87] Woodford, M. 2005. "Central-Bank Communication and Policy Effectiveness." Paper presented at the Federal Reserve Bank of Kansas City Symposium, Jackson Hole, Wyoming, August 25–27.